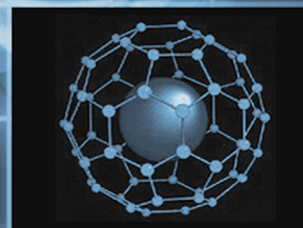
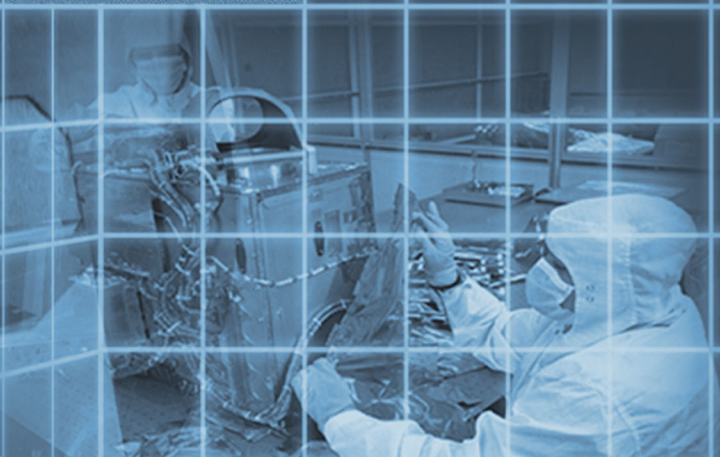
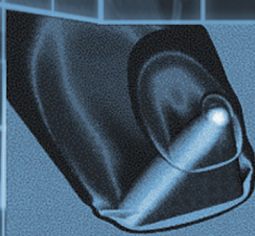




International Science and Technology Strategy for the United States Department of Defense

April 2005



Department of Defense
Defense Research & Engineering

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I am pleased to introduce this International Science and Technology Strategy for the United States Department of Defense. This top-level document is intended as guidance for our entire DoD science and technology community. We also trust that our many international allies and partners will find it useful.

Technology continues to be a major cornerstone in the many operations performed by our soldiers, sailors, airmen and marines. It is also a commodity that knows no national bounds. To this end, the United States has pursued, and will continue to pursue, a vigorous international program in defense related science and technology. The program is vast and multi faceted in its taxonomy and is constantly searching for new technologies that will improve our military. This strategy will hopefully provide connectivity among these various elements.



In his cover letter to *The National Security Strategy of the United States of America*, President George W. Bush states, "Today, the international community has the best chance since the rise of the nation-state in the seventeenth century to build a world where great powers compete in peace instead of continually prepare for war." President Bush further states, "The United States will build on these common interests to promote global security." Cooperative international science and technology must be one of the building blocks to achieve this.

The preservation of technological superiority is a key component to our national security strategy. It is also equally critical to our allies and partners. In peace it provides deterrence; in crisis it provides options; and in war it provides the edge.

A handwritten signature of Ronald M. Sega in black ink.

Ronald M. Sega
Director, Defense Research and Engineering

**International Science and Technology
Strategy for the United States
Department of Defense**



April 2005

**Department of Defense
Defense Research and Engineering**

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Introduction

The United States has an extensive defense science and technology (S&T) program that is the foundation of the technology base from which U.S. defense capabilities are developed, acquired and maintained. S&T collaboration with allies and international partners enhances the U.S. S&T program and contributes to U.S. and partner nations' technological capabilities, coalition operations, and mutual national security interests. This document provides a top-level view of the DoD strategy for international collaboration in U.S. defense S&T activities. It is intended for use by both the U.S. and our international allied defense S&T communities.

Global Nature of National Security

The National Security interests of the United States are undeniably global in nature. As the US continues the Global War on Terror (GWOT), it is important to recognize that the national security interests of the United States, and that of our allies, are intertwined. Our military forces have recognized this global nature for decades, and as the visions and strategic plans of the United States Army, Navy, Air Force and Marines demonstrate, they are prepared to take action as needed. It is imperative that our defense science and technology program mirror this preparedness. International science and technology activities are unquestionably a key ingredient for the long-term future of our national security and that of our allies. The strategy provided in this document will continue to assure our Nation and our partners of our intent to not only maintain this security posture, but to strengthen it.



President George W. Bush addresses the United Nations General Assembly in New York City Tuesday, Sept. 23, 2003

Service S&T Laboratories, Agencies and International S&T Offices

The DoD S&T Program is guided by a variety of Service S&T Laboratories and DoD Agencies, most of which maintain international S&T offices both within and outside the U.S. Among other objectives, this document is intended to assist them with top-level strategic policy guidance for application in their day-to-day operations.

Scope

The remainder of this document discusses Rationale for International S&T Cooperation, Broad Areas of Interest, the US Approach to International Cooperation, and US Goals and Expectations. It concludes with a brief Summary.

Rationale for International S&T Cooperation

There are varied reasons to support international defense S&T cooperation in areas significant to national security. Currently, the non-U.S. component of global R&D is more than 60% of the total global investment and is expected to continue to outpace the U.S. contribution. Leveraging this investment through international partnerships is an intelligent strategy not only for the U.S., but for all nations that have the technological capacity to enter into mutually advantageous partnerships. The rationale for these partnerships include: mutual enhancement of resources for both the United States and its partners, risk reduction through multiple technical approaches to solve difficult technical problems, access to unique research laboratories and facilities, improving the warfighting capabilities of all involved, and the potential for enhancing interoperability during coalition operations.

Resource Enhancement

The United States enjoys a robust economy and a broad science and technology program oriented toward national security. It should be noted however, that technical excellence can be found in defense science and technology enterprises supported by the economies of Europe and the Far East, as well as nations with far smaller but more focused research thrusts. Nations bordering the Pacific Rim, South Asia, and in Latin America also have centers of excellence and are home to world class scientists and engineers. The strategy of the Department of Defense is to acknowledge the global distribution of talent, expertise, and investment among our allies and friends in the defense sciences in both the public and private sectors, and to seek out mutually advantageous research collaborations. Leveraging our allies' and friends' investments serves all participants by saving resources, accelerating transitions, and expanding the global knowledge base.

Multiple Technical Approaches

One of the best mechanisms for solving difficult technical problems is for multiple teams to take different technical approaches and share incremental progress with each other. A key element of our strategy is to maintain close contact with the world's leading defense technical specialists and to exchange ideas about various technical approaches to solving our difficult problems of mutual interest on a quid-pro-quo basis through regular participation in bilateral/multilateral collaborations and international professional societies. This is a solid approach to problem solving for our DoD science and technology programs, with a greater potential for breakthrough solutions.

Unique Resource Access/Availability

In recognizing the advantages of the international leveraging process, it is the strategy of the Department of Defense to both seek out and provide appropriate access to unique laboratory resources. Infrastructure maintenance and support for such resources are a significant expense which can be reduced through sharing arrangements. This is especially helpful if a requirement is near term in nature and is not long term in frequency of need.

Improving Warfighting Capabilities

A significant rationale for international science and technology cooperation is improving the warfighting capabilities of the United States and our international partners. Collaboration in S&T will make significant contributions to closing technology gaps with coalition partners, allies and friends. In doing so, there must be clear mutual benefit and interoperability advantages.



Enhancing Interoperability

A key adjunct to improving the warfighting capabilities of the United States and our future coalition partners is interoperability. It is imperative that the science and technology communities in the United States and around the world recognize the positive impact that they can have in this area. Clear thought must be given early in the process of fundamental research and technology development to the impact specific technical approaches taken to address our warfighting requirements may have on future war fighting and interoperability. Whenever possible, we must develop technology solutions that enhance the potential for all warfighters to interact on the battlefield.

Broad Areas of Interest

This *International Science and Technology Strategy for the United States Department of Defense* responds to the vision of developing and transitioning superior and affordable technology to the warfighters. The technologies called for in this document support today's missions and will provide decisive revolutionary military capability across the full spectrum of crises and challenges of an uncertain future. While each Service has its specific S&T focus, this strategy focuses on five areas of high priority: basic research, information assurance, battlespace awareness, force protection, and reduced cost of ownership. In addition to these five areas, the DoD has also identified three transformation initiatives that could dramatically increase the operational capabilities of our armed forces: the National Aerospace Initiative, Power and Energy Technologies, and Surveillance and Knowledge Systems. All of these are described briefly in the following paragraphs.

Basic Research



Basic research is a long-term investment for significant improvement in the capabilities of our military forces. The Department of Defense will continue to invest substantially and broadly in defense-relevant scientific fields based on the proven experience that such research and investment leads to significant improvements in capabilities. As basic research is one of the most fruitful areas for international cooperation, the DoD will continue to pursue international collaborative

opportunities in all areas that are relevant to defense.

Information Assurance



Information technology is a vital research and technology area for the DoD and will become even more significant as we move further into the 21st century. The Department of Defense will continue to identify technologies that will address activities related to cyberterrorism and provide

better protection for critical information systems, both on the battlefield and around the world. The focus of the S&T investment is on providing the technology base to ensure that our forces can acquire, verify, protect and assimilate the information needed to effectively neutralize and dominate adversary forces.

Battlespace Awareness



The future will continue to see a proliferation of sensors and associated processors for battlespace use. Total battlespace situation awareness and understanding, coupled with information assurance, will provide real-time intelligence from “sensor to shooter.” Commercial and military space technology and systems will continue to provide major leaps in coverage, timeliness, and resolution. As a result, the amount of raw information available to the battlefield commander and soldier, sailor, airman, and marine as well as our coalition partners

will also increase. The DoD will work to integrate networks of sensors to provide near real-time representations for complex battlefield information to the warfighters. The volume of information available to the warfighter will result in the need for technical help in sorting, understanding and acting on that knowledge. The DoD will continue to find and develop technologies to increase battlespace awareness that will produce decision superiority.

Force Protection

The 21st century warfighter must have the capabilities to survive, fight, and win in an unpredictable environment, countering both conventional and unconventional weapons. Technologies associated with contamination avoidance, protection, and force sustainment will continue to be emphasized, as will technologies to identify hardened and deeply buried targets and provide timely notification to shooters. Improved penetrating munitions will be developed for counterforce missions. Technology to counter specific Force Protection threats and weapons, taking advantage of automation and robotics and non-lethal responses will also be pursued. Missile defense is an area that will also receive continuing emphasis. The DoD will develop the technologies that protect our forces and allow them to operate wherever needed.



Reduced Cost of Ownership

The DoD has embarked on modernization and transformation of our forces to ensure continuing readiness for the world in which we live today and in the future. For this

modernization and transformation to be possible, the S&T program must provide advanced technology that is timely and affordable. The cost of ownership, operation, maintenance and evolutionary upgrade is at times greater than the cost of acquisition for many systems. Thus, full lifecycle costs will be properly considered during technology development and demonstration. The DoD supports the development of affordable technologies and pursues programs specifically aimed at reducing life-cycle/logistics costs.

Two initiatives to reduce acquisition costs are the Advanced Technology Demonstration (ATD) and Advanced Concept Technology Demonstration (ACTD) programs. Both approaches have been in existence for more than ten years and they are designed to help expedite the transition of mature technologies from the developers to the users. ACTDs emphasize assessing and integrating technology rather than developing it. The goal is to give the warfighter a prototype capability and to support the warfighter in evaluating that capability. The warfighters develop concepts of operations and evaluate the capabilities in real military exercises at a scale sufficient to fully assess their usefulness. ATDs on the other hand are a process for managing S&T programs to demonstrate a military capability in an experiment, field test, or simulated operational environment. ATDs are used to accelerate the maturation of technologies needed for either the next-generation systems or upgrades to existing legacy systems. In both cases, partnerships with international allies can further accelerate the transition.

Transformation Initiatives

The continuing transformation of our military forces to meet evolving threats is a major effort of the DoD. Consequently, the DoD has identified three S&T initiatives that provide potential transformational benefits in several ways. These are: the National Aerospace Initiative, Power and Energy Technologies, and Surveillance and Knowledge Systems.



Hypersonic Flight



Access to Space



Space Technology

The National Aerospace Initiative is an integrated technology framework to dramatically increase the capability to operate in the aerospace environment. It is comprised of three pillars: high speed/hypersonic flight, access to space, and advanced space technology. If successful, these three pillars could provide the capability to launch a

group of microsatellites into any orbit location and align them to provide on-demand high resolution optical and radar surveillance. These capabilities could transform key aspects of future U.S. and coalition war fighting doctrine.

The Power and Energy Technologies Initiative seeks to develop devices that will radically reduce the logistics burden and dependence on fossil fuels and significantly expand the envelope of warfighting capabilities. There are three principal thrusts to accomplish this: power generation, energy storage, and power control and distribution.

The Surveillance and Knowledge Systems Initiative focuses on C4ISR with the objective of developing joint warfighter information and decision superiority. This initiative focuses on the development of technology to enable the concept of network centric warfare and spans every aspect of the information spectrum from collection and dissemination to understanding and knowledge, both vertically from the soldier to commander and horizontally across the Military Departments and Defense Agencies.

U.S. Approach to International Cooperation

Defense science and technology is managed through a tiered structure with the Services' and Agencies' program officers at the base. The program officers direct investments ranging from basic through applied research to advanced technology development, and are expected to be globally aware of their technical discipline. To assist in this, each Service maintains technical representatives in Service-sponsored international offices located in the U.K., Japan, Singapore, Australia, and South America. These representatives serve as liaison with the international S&T community; not only government to government, but with academic and industrial entities as well. As enablers of the communication necessary to foster international cooperation, the international office representatives serve a vital role in identifying mutually advantageous collaborative opportunities, brokering new research partnerships, and exchanging information with potential partners regarding research interests.

The next tier within international S&T management is that of international agreements which are necessary to allow the exchange of people, information and material. These agreements are critical to mutually protect each party in a collaboration, and when successful, lead to cooperative research and technology programs. These agreements arise from successes in the basic research phase and may lead to project agreements, foreign comparative tests, and technology demonstrations. Experts within the various Offices of Defense Collaboration (ODCs) in U.S. embassies can provide additional guidance on these tools to potential partners.

The generation and execution of these international agreements are supported via several avenues, including the North Atlantic Treaty Organization (NATO), The Technical Cooperation Program (TTCP), multilateral agreements, and bilateral agreements. Each of these is described briefly in the following paragraphs. The focus here is on government-to-government activities, although it is fully recognized that direct grants and contracts to universities and commercial entities are also integral components of our international S&T enterprise.

NATO Research and Technology Organization



The NATO Research and Technology Organization (RTO) is the largest body of its type in the world and offers the best opportunities for sharing defense-related S&T information among the allied nations. The United States will continue to be an active participant at all levels of the RTO, including the Research and Technology Board, the Research and Technology Agency, the Technical Panels, and a wide variety of specific technical activities. These include technical activities associated with applied vehicle technology; human factors and medicine; information management; information systems technology; modeling and simulation; sensors and electronics; systems analysis and simulation; and systems concepts and integration. In addition, the DoD will appropriately pursue and accept leadership opportunities at all levels of the RTO as these opportunities present themselves. DoD participants will bring forward relevant technology, using appropriate policy and regulatory guidance, to share with our NATO colleagues. Finally, we will actively participate with NATO's Allied Command Transformation to showcase our technologies in appropriate NATO demonstrations and experiments.

The Technical Cooperation Program



The United States recognizes the special relationship that exists between Australia, Canada, New Zealand, the United Kingdom and itself. The DoD will continue to be an active participant at all levels in TTCP. Furthermore, the United States will advocate information exchange, harmonization and alignment, and project arrangements for basic research, exploratory development and demonstrations of advanced technology in the following technical areas: aerospace systems; command, control, communications and information systems; chemical, biological and radiological defense; electronic warfare systems; human resources and performance; joint systems and analysis; maritime systems; materials and processing technology; sensors; and conventional weapons technology. Increased emphasis will be given to project arrangements that emphasize work sharing and/or equipment and material transfer.

Multilateral Agreements

Multilateral agreements offer the signatory nations opportunities to cooperate at higher levels of S&T specificity and classification. The U.S. DoD will continue to develop these agreements as appropriate. Emphasis will be given to regional areas where cooperation and demonstration of new technologies can have significant near-term impact on US national security or that of allies and partners.

Bilateral Agreements

The U.S. DoD maintains a broad range of bilateral science and technology agreements and we will continue to do so. These agreements cover the range of technical areas of interest to both parties and encompass basic research through advanced technology development. The specificity and classification of these agreements will continue to be based upon the mutual desires of the signatory nations.

U.S. Goals and Expectations

Active Program

The DoD will maintain and advocate an active international science and technology program involving every element of the S&T enterprise: the Director of Defense Research and Engineering, the Defense Advanced Research Projects Agency, the Missile Defense Agency, the Defense Threat Reduction Agency and, most importantly, the Service S&T Laboratories. Reliability among partners is both promised and expected to ensure program success.

Best People

The DoD and the Services will assign the best scientific, engineering and management personnel to represent the U.S. in international S&T activities, and will also provide our personnel with all necessary support to accomplish their tasks.

Reasonable Investments

The DoD will invest reasonable amounts of time, funding and knowledge in international science and technology from all three fundamental elements of the S&T program: basic research, applied research, and advanced technology development. DoD will especially emphasize and sustain basic research activities in areas that promise highly significant opportunities and technological returns. We will also strive to increase advanced technology development activities that show specific promise for enhanced interoperability with our allies and potential coalition partners. Emphasis will be given to demonstrating these technologies in a coalition environment.

Reasonable Return on Investments

DoD expects reasonable returns on investments of time and funding. These returns should clearly demonstrate increases in the defense technological capability of the U.S. It is also our expectation that similar increases in defense technological capability will result for our allies and potential partners. A fundamental aspect of these returns on investment will continue to be found within forums sponsored by NATO, TTCP, multi-lateral agreements

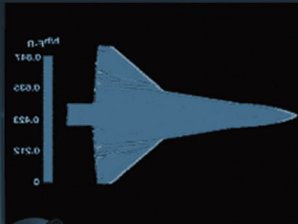
and bi-lateral agreements, and it is our expectation that both the United States and our allies will bring results from their best work to these forums.

Avoiding Technological Surprise

Worldwide knowledge of defense related science and technology is fundamental to avoiding technological surprise. To this end, we will continue to remain cognizant of emerging technologies by being active participants in appropriate international forums.

Summary

This document presents an overview of the international science and technology strategy for the United States Department of Defense. It is our expectation that it will be useful to the DoD S&T enterprise as well as to our international allies and partners. It is anticipated that this guidance will be incorporated by the DoD staff, agencies and Service labs as they prepare their S&T plans.



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